

Networks *Digest*

A spotlight on network-related resources

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How Breakthroughs Happen: The Surprising Truth About How Companies Innovate

Andrew Hargadon

"In the field of observation, chance favours only the prepared mind." Louis Pasteur

Hargadon's book, which is addressed to the business community, presents the case that innovation seldom arises from the minds of brilliant thinkers given time to ruminate, but usually from recombinant networks of people, ideas, and objects. The author, an assistant professor in technology management at the University of California, Davis' graduate school of management, defines innovation from a "networked" perspective as a new relationship between people, ideas, and material objects. In Hargadon's view, innovation results from the exploitation of existing technologies, rather than from exploration.

Historical examples

How Breakthroughs Happen describes the stories of inventors like Thomas Edison (the telegraph, electric light bulb, and vacuum pump), Robert Fulton (the steamship), Henry Ford (the assembly line and interchangeable parts), and Design Continuum (the Reebok pump) to illustrate the underlying dynamics of the innovation process. Hargadon argues these individuals and teams were not smarter than others; they were better-connected and better at moving through their multiple networks or worlds.

For example, Thomas Edison's Menlo Park was a commercial laboratory that brought together ideas from many perspectives. Members of the Menlo Park consulting team accepted engineering projects from different industries in addition to their in-house projects. The consulting work forced the researchers to bridge different worlds and see the possibilities of new combinations. This fertile ground resulted in the discovery and implementation of a continuous stream of innovations.

In another example, Henry Ford's "revolutionary" use of interchangeable parts in an assembly line production system was, in reality, built on

Key messages

- Innovation seldom arises from the minds of brilliant and isolated thinkers, but rather from new combinations of people, ideas, and objects.
- Innovators need wide-ranging ties across diverse worlds to generate new ideas, and they also need strong, focused ties to build communities around these ideas once they are transplanted.
- The ties that bind are also the ties that blind.
- "If someone walks into the meeting with a coffee mug like yours, it's time to find another one." (IDEO engineer)

innovations borrowed from Eli Whitney (horse pistol production), Walter Flanders (Singer Manufacturing Company), the Chicago meat packing industry, and others.

How innovation happens

When breakthroughs happen, groups of people, ideas, and objects form new relationships, often overnight, and render old linkages obsolete. This quick rearranging is likened to a phase transition in physics in which seemingly small changes trigger much bigger shifts.

Once new linkages are made, innovators must help build communities around the emerging ideas. The paradox embedded in the innovation process is that innovators need wide-ranging ties across distant worlds to generate innovative ideas, yet they also need strong, focused ties to build communities around these emerging products or processes.

Hargadon argues that recombinant innovations happen less often than some businesses would like because few people can see how the resources of one world might benefit another, and fewer still are prepared to act on what they see. Few people can develop in-depth knowledge in one area (tighten one's grasp) and still be emotionally able to take that knowledge apart and combine it in new ways (loosen one's grip).

Technology brokers

In the world of big business, which is the source of most of Hargadon's examples of innovation, a "technology broker" is a group of people (team or

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company) that spans multiple small worlds and builds support for new combinations. Law firms, venture capitalists, and engineering firms are potential technology brokering organizations. Hargadon recommends companies decide on the level of their commitment to innovation and describes three options:

1. dedicate the entire firm to the pursuit of innovation through technology brokering (IDEO);
2. stay focused on existing markets and customers, but create groups that are freed from their operating responsibilities and that focus on bridging worlds and finding ideas (Dupont, Hewlett Packard, Xerox, 3M); or
3. develop an organizational ability to recognize and seize one-time opportunities for recombinant innovation. An example of this is the researchers' second take on the disappointing clinical trial results for a drug to relieve the symptoms of angina. Seen through the eyes of innovation-sensitive researchers, the "poor" results led to the discovery of a valuable product – Viagra.

Technology brokering strategies

Hargadon uses industrial examples to show how innovation results from people consciously employing technology brokering strategies to create the open minds that can generate innovative ideas (bridging small worlds) and then, equally importantly, build communities around the emerging ideas (building new worlds) without losing control of the idea. The challenge for managers is to simultaneously encourage doubt and dedication: doubt in the small worlds of today and dedication to building new ones.

1. Strategies for bridging small worlds (invention)

- *Emphasize breadth over depth.* The skill here is to understand how much depth is enough and how much is too much.
- *Get your hands dirty.* Employees need to work in the different worlds, not just observe. Working in a new environment helps people see what they know in a new way.
- *Bring the outside in.* Bring in experts to poke at your expertise rather than build it.
- *Take the best and leave the rest.* One of the original engineers at IDEO said moving among worlds creates a toolbox filled with great tools that have had all the labels taken off about how to use them.

2. Strategies for building new worlds (commercial exploitation)

- *Mix and match.* Encourage people to work closely with at least one other person (Steve Jobs and Steve Wozniak, Bill Gates and Paul Allen). Bring together complementary personalities, skills, and ideas. Hire a pair or a whole team. Find the right mix of individuals, skills, and experiences to turn a vision into reality.
- *Build multiple networks.* Make efforts to exploit the experiences of others in the organization and elsewhere.
- *Practice "equal but separate."* Fragment the larger network to spur smaller collectives into action.

The eight rules

Hargadon offers eight rules to help managers pursue innovation through technology brokering.

1. *Never forget the future is already here.* It's just unevenly distributed.
2. *Analogy trumps invention.* Constantly ask how things are the same, not how they are different.
3. *Find your discomfort zone.* Sitting between worlds means not being fully accepted by any one, but also being free from the ties of any one small world.
4. *Divided we innovate.* Embrace the boundaries in organizations; they allow teams to develop the in-depth knowledge that offers opportunities for innovation.
5. *Bridge to your strengths.* Find worlds you know little about but where your own knowledge looks valuable.
6. *Build to your weaknesses.* Find others to join you who complement your skills.
7. *As go the individuals, so goes the organization.* Reward employees who make connections between what they saw before and the problems they and others are facing now.
8. *Rip, mix, and burn.* Take from what exists, recombine things, and create a support system for the new mix.

Technology brokering strategies can help companies exploit fortuitous accidents and create opportunities for these accidents to be recognized. Hargadon argues industries that push their people to think "in other boxes," rather than "out of the box," produce more successful innovations.

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